Tips to analyze the pendulum data in matlab

By now some of you have collected data on the damped driven pendulum in the lab. You should also have ftp-ed your data to your home directory. Now if you want to analyze a data set, pendulum.dat, this is how you'd go about doing it:

Startup copy the file to a separate directory. delete the first two lines of your data file (containing header information) and then start matlab from that directory.

Load data from the matlab prompt type in
> load pendulum.dat
you should now have a variable called pendulum (matlab automatically truncates all extensions.), if your file name was BANANAS you should now have variable called BANANAS.

Create variables the variable pendulum is a 3 column vector $(\theta, \dot{\theta}, n)$, where n is the winding number and corresponds to the number of times that pendulum went from π to $-\pi$. To create a separate variable called "theta" type the following
> theta=pendulum(:,1)
where the 1 corresponds to the first column (for thetadot and n just use the 2nd and 3rd column respectively). If your winding number n differs from 0 at some values you might want to correct theta by
> theta=theta+n*2*pi

Visualize the data just to be sure you understand what's happening with your data set try to plot the time series, $\theta(t)$, or even the phase space $(\theta(t), \dot{\theta}(t))$. for example to plot the phase space, try
> plot(theta,thetadot,'k-')

Data analysis now you're ready to do the problem. Use fourier.m to calculate power spectra as before. You can do this for either one of the two variables (theta or thetadot) e.g.
> [k,s]=fourier(theta).
The autocorrelation is not that difficult to code up by hand, but you might find it useful to do the following,
> help xcorr

For further instructions contact the TA.